AMS.2012-198501

Climate Services and Renewable Energy: Providing Climate Information for the Next 1-30 Years

IC3

EEWRC

DHMZ

ENEA, PIK

CLIM-RUN

Climate
Local
Information in the
Mediterranean –
Responding to
User
Needs

M. Davis , F. J. Doblas-Reyes, J. Garcia Serrano, F.Lienert, V.Guemas.
Climate Forecasting Unit (CFU)

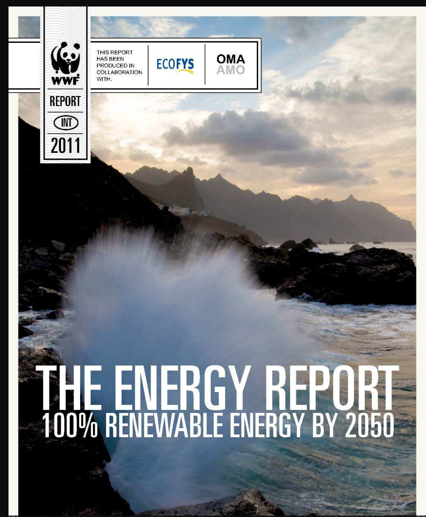
Anticipated Result

Facilitate mid to long-term investment, innovation and planning for the Renewable Energy Sector

European Commission Climate Action

"20-20" targets

20% Renewable Energy by 2020



100% Renewable Energy by 2050

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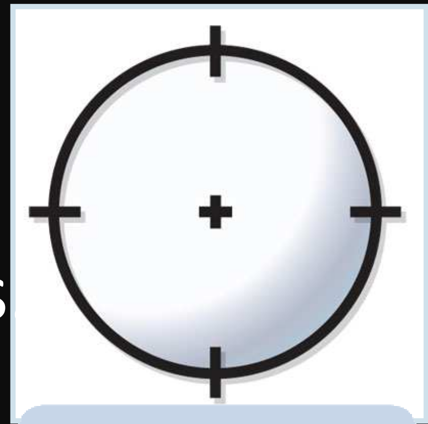
How to achieve the results?

Advance the reliability, accuracy and availability of mid-long term climate data using seasonal to decadal forecasts



Quantify the likelihood of significant future changes in climate conditions or patterns (including extreme events).

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Why is this needed?

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Wind farms failing to produce enough power... because there's not enough wind

By FIONA MACRAE

Last updated at 9:42 AM on 22nd March 2010

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Some of Britain's most beautiful landscapes have been blighted by wind farms for only small returns in energy, research shows.

The analysis of power output found that more than 20 wind farms are operating at less than one-fifth of their full capacity.

Experts say many turbines are going up on sites that are simply not breezy enough.

They also accuse developers of 'grossly exaggerating' the amount of energy they will generate in order to get their hands on subsidies designed to boost the production of green power.

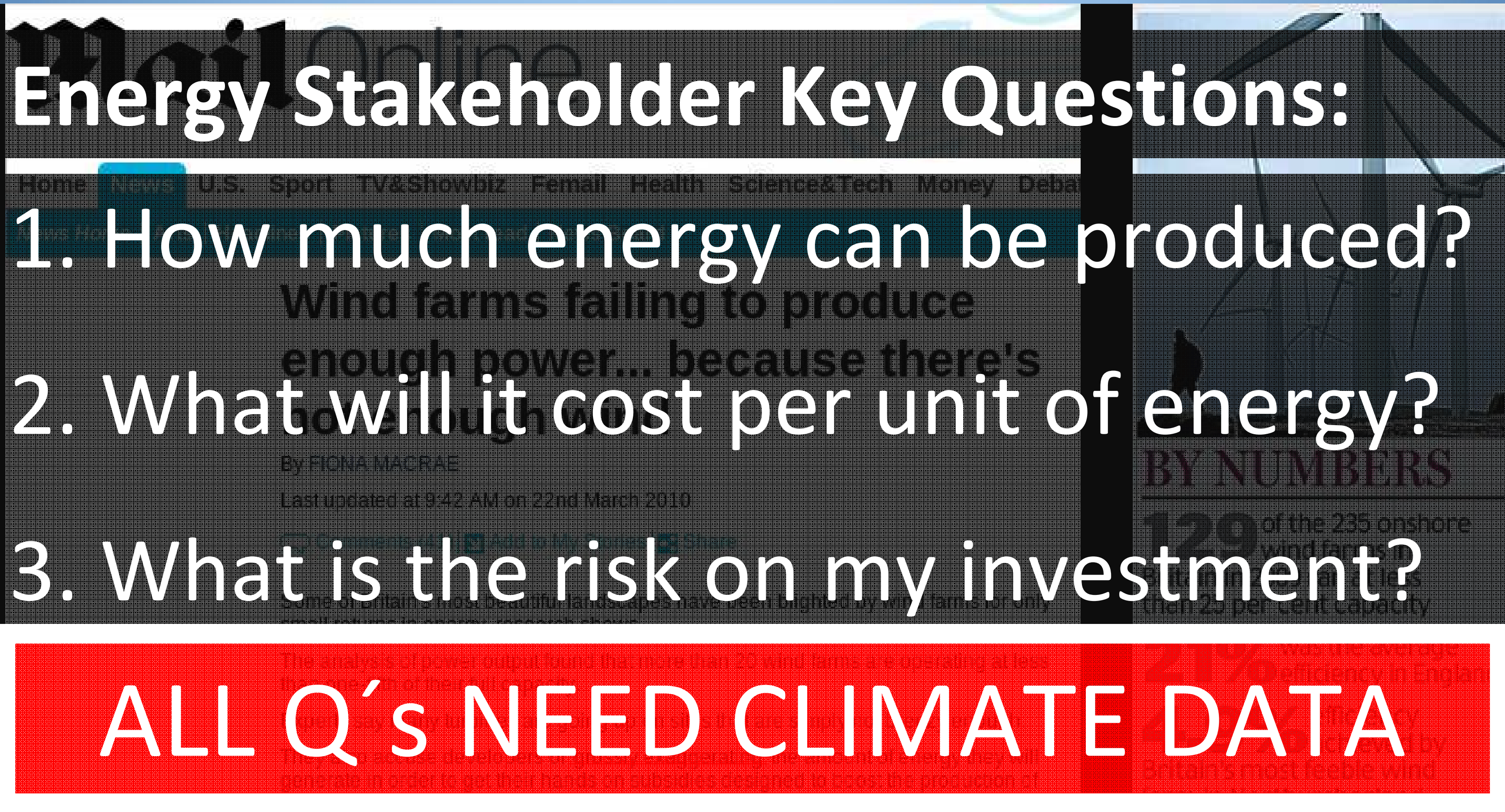
BY NUMBERS

129 of the 235 onshore wind farms in Britain in 2009 ran at less than 25 per cent capacity

21% was the average efficiency in England

4.9% efficiency achieved by Britain's most feeble wind farm in Northumberland

Why is this needed?



Energy Stakeholder Key Questions:

1. How much energy can be produced?
2. What will it cost per unit of energy?
3. What is the risk on my investment?

ALL Q´s NEED CLIMATE DATA

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Climate Affects Investment

Investment influence of climate resource variability

Fictional Example: planning of a solar power plant in Spain

- Typical size: 50 MW, cost €300 million
- Guaranteed price per unit of electricity generated: 0.20 €/kWh
- This provides an annual revenue of €31 million

***Assumptions:* small solar irradiance variation**

Uncertainty of 1% leads to:

- Annual increase or decrease of total revenue = **€310,000**

-Across the investment return period = **€8 million**

or ~ 15% investment

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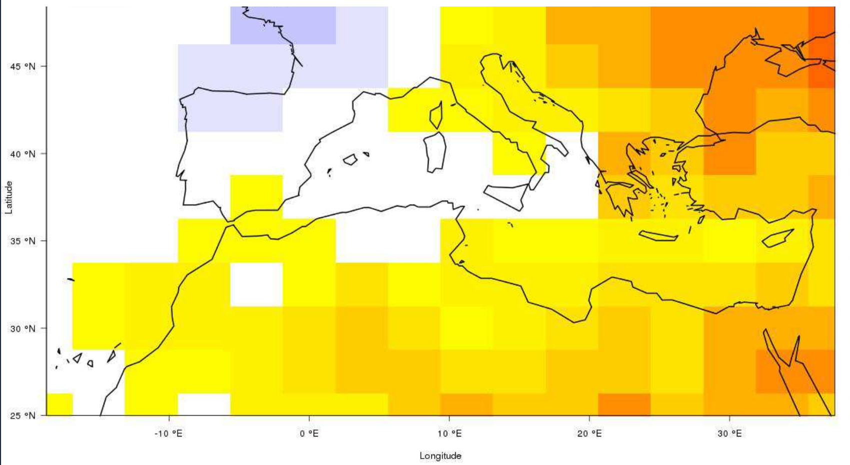
CLIM-RUN WP7 Questions

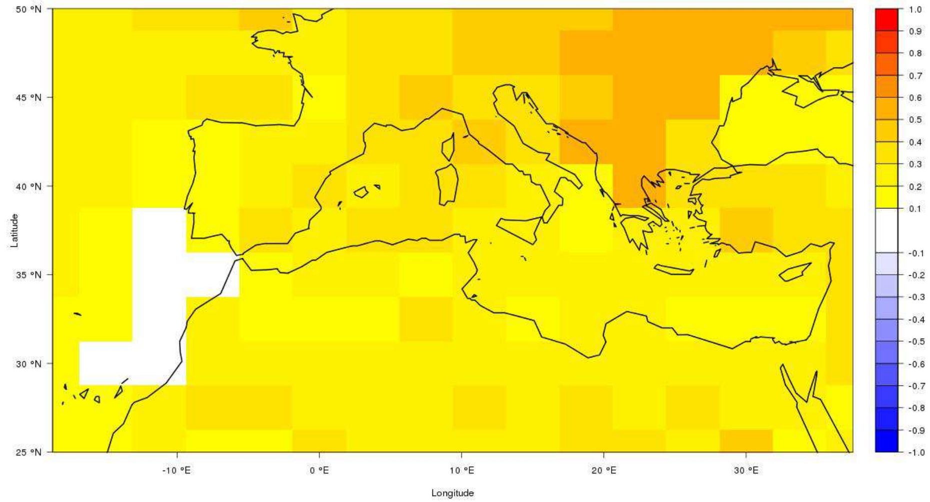
- ? How representative is the current climate resource data for estimating the energy yield of a RE system over its lifetime?
- ? How confident can we be about energy yield forecasts?
- ? What is the likely lowest level, and frequency of low energy yield from a RE project in a season/year? (´´energy droughts´´)
- ? How can solar and wind climatic resources co-vary to supply a more consistent stream of energy (i.e. cash flow)?

A. Observed temperature at surface (k) 2005-2010

Scale: variation from long term, historical mean values



B. Forecast temperature at surface (k) 2005-2010



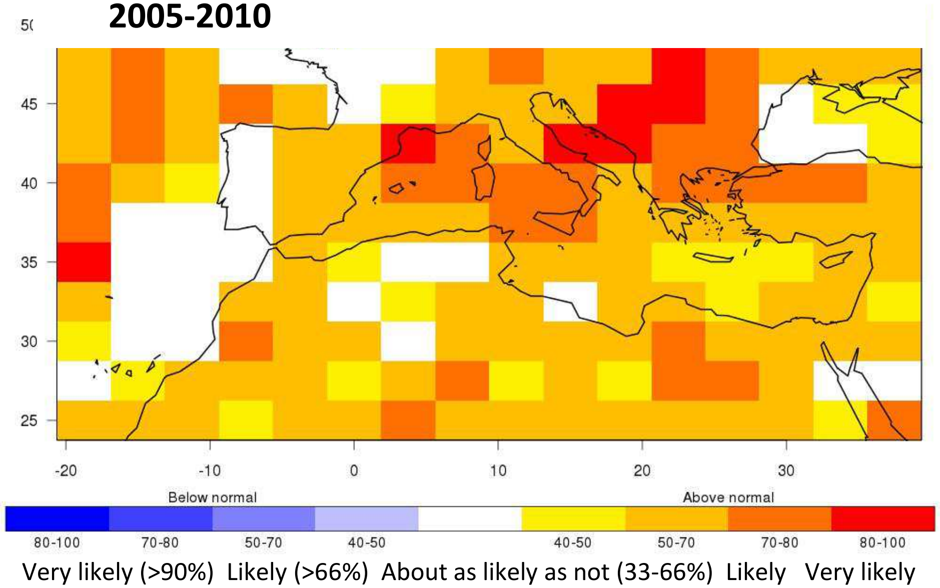
Temperature Variability in the Mediterranean (2005-2010)

A: Observed

B: Forecast

C: Probability of the most likely temperature category

C. Probability most likely temperature tercile (%) 2005-2010



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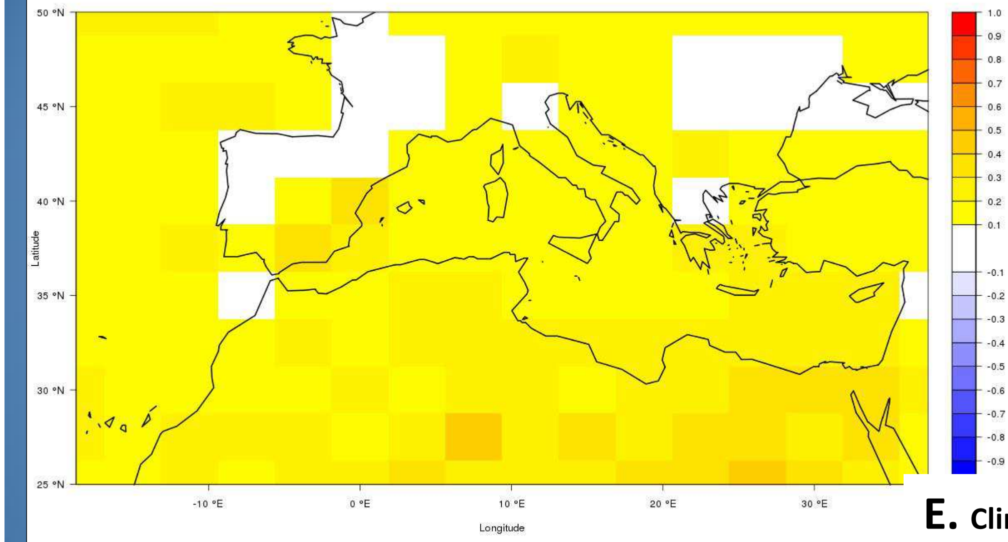
D. Forecast **temperature at surface (k) 2010-2015**



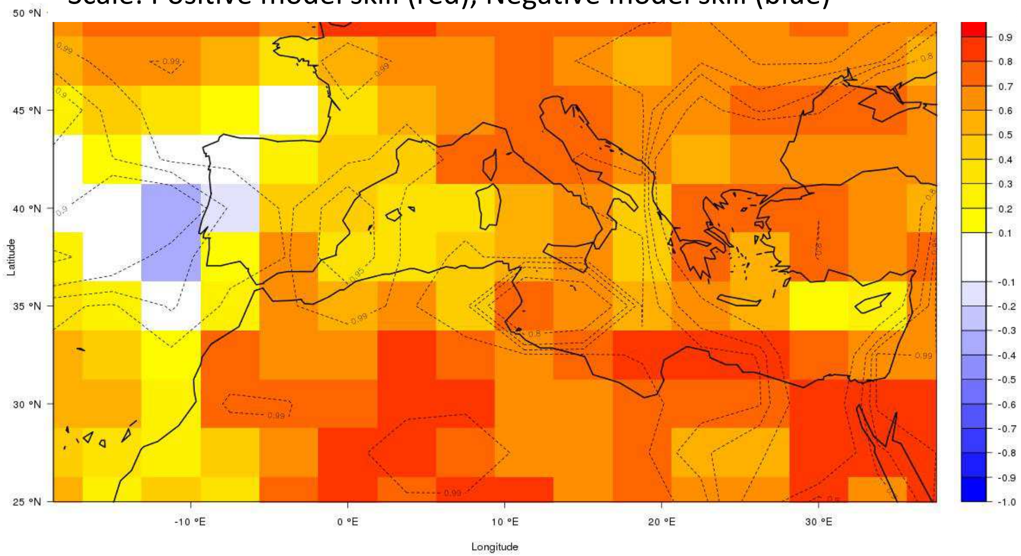
Temperature Variability in the Mediterranean

D: Forecast (2010-2015)

E: Anomaly correlation skill with contours of 1-p

E. Climate model skill demonstrated by the correlation of modelled, temperature at surface from 1960 with observed data

Scale: Positive model skill (red), Negative model skill (blue)



Key messages:

- **50-70% probability to be above normal was common for 2005-10 temperatures**
- **Slight, consistent warming across Mediterranean (except in confined regions)**
- **Consistently +´ve anomaly correlation**

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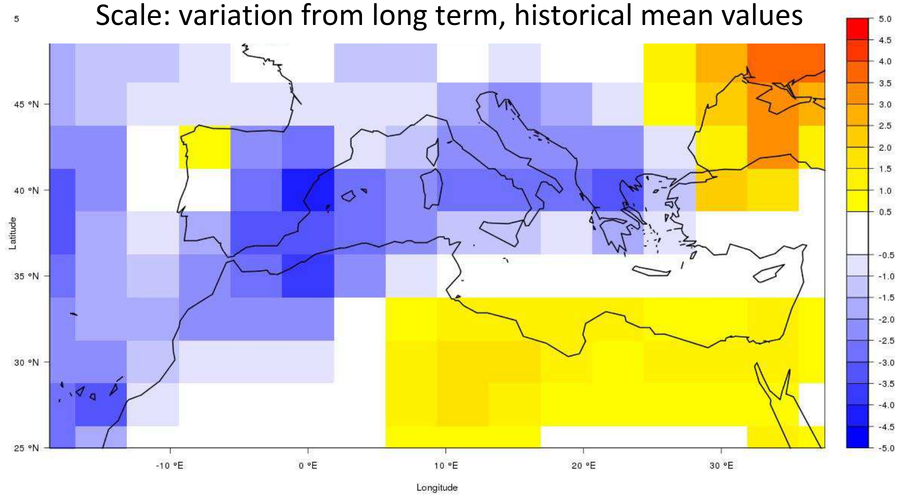
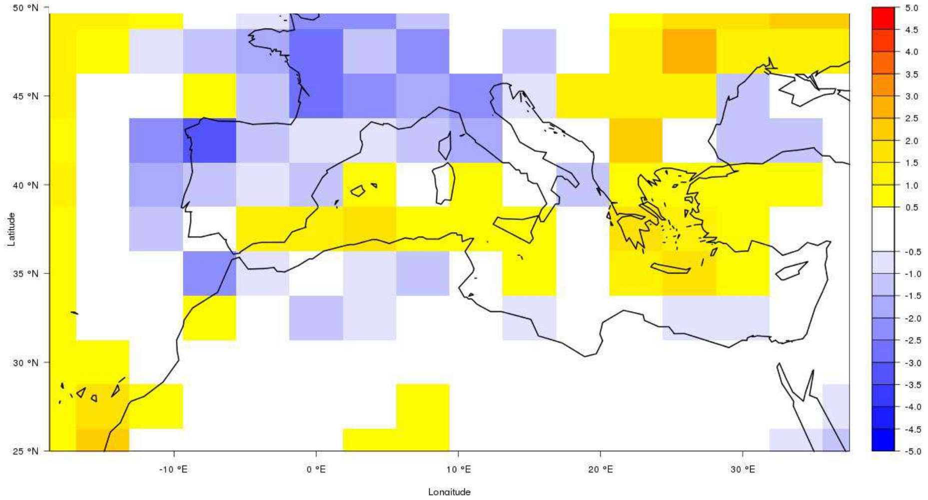
F. Observed downward solar radiation at surface (W/m²) 2005-2010

Scale: variation from long term, historical mean values



G. Forecast downward solar radiation at surface (W/m²) 2005-2010



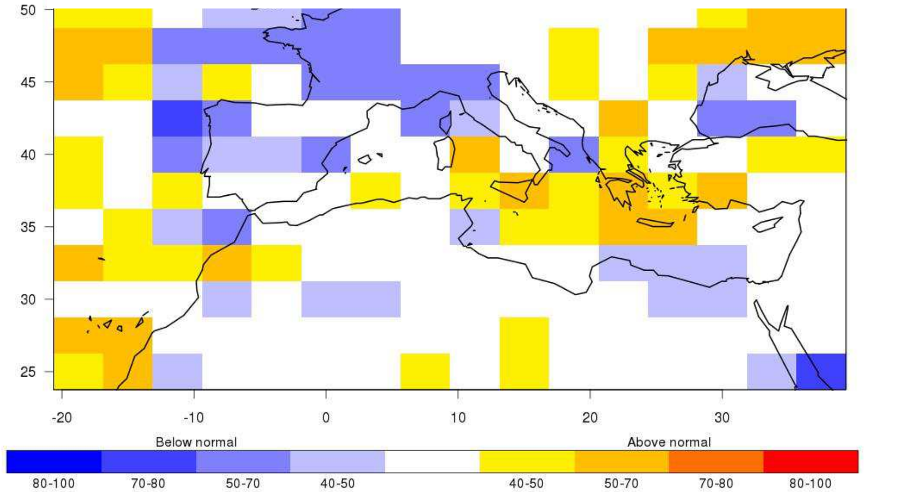
Downward Solar Radiation Variability in the Mediterranean (2005-2010)

F: Observed

G: Forecast

H: Probability of the most likely solar radiation category

H. Probability most likely downward solar radiation tercile (%) 2005-2010



Very likely (>90%) Likely (>66%) About as likely as not (33-66%) Likely Very likely

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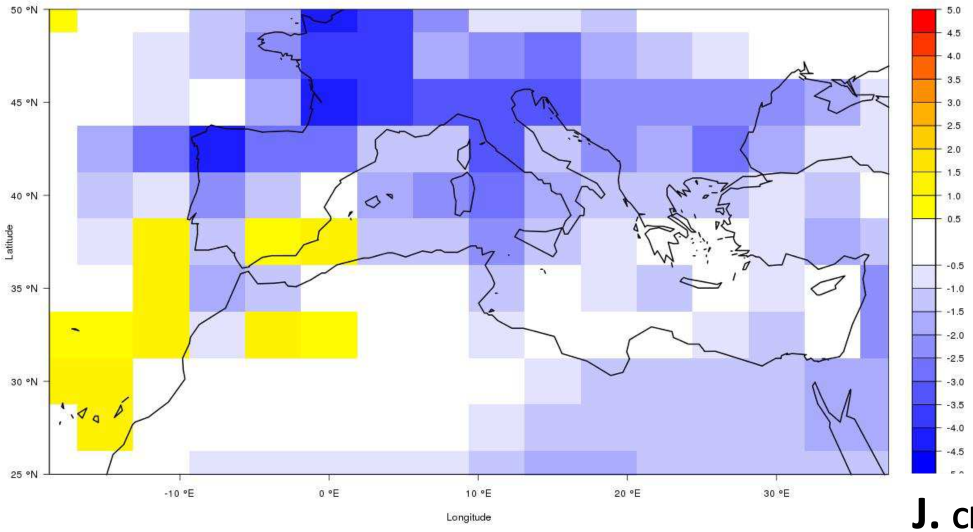
I. Forecast downward solar radiation at surface (k) 2010-2015



Downward Solar Radiation Variability in the Mediterranean

I: Forecast (2010-2015)

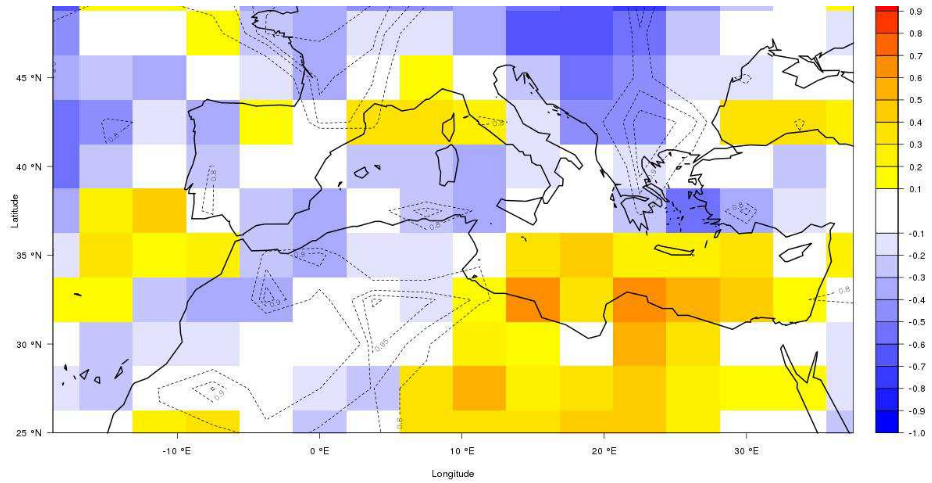
J: Anomaly correlation skill with contours of 1-p

Key messages:

- **Although the prediction is for overall reduced solar radiation, the anomalies do not verify this**
- **Highlights need within the RE sector for better observed climate data & correction of climate forecasts by specialists**
- **Next steps: post processing of the global model output (downscaling and calibration)**

J. Climate model skill demonstrated by the correlation of modelled, downward solar radiation from 1960 with observed data

Scale: Positive model skill (red), Negative model skill (blue)



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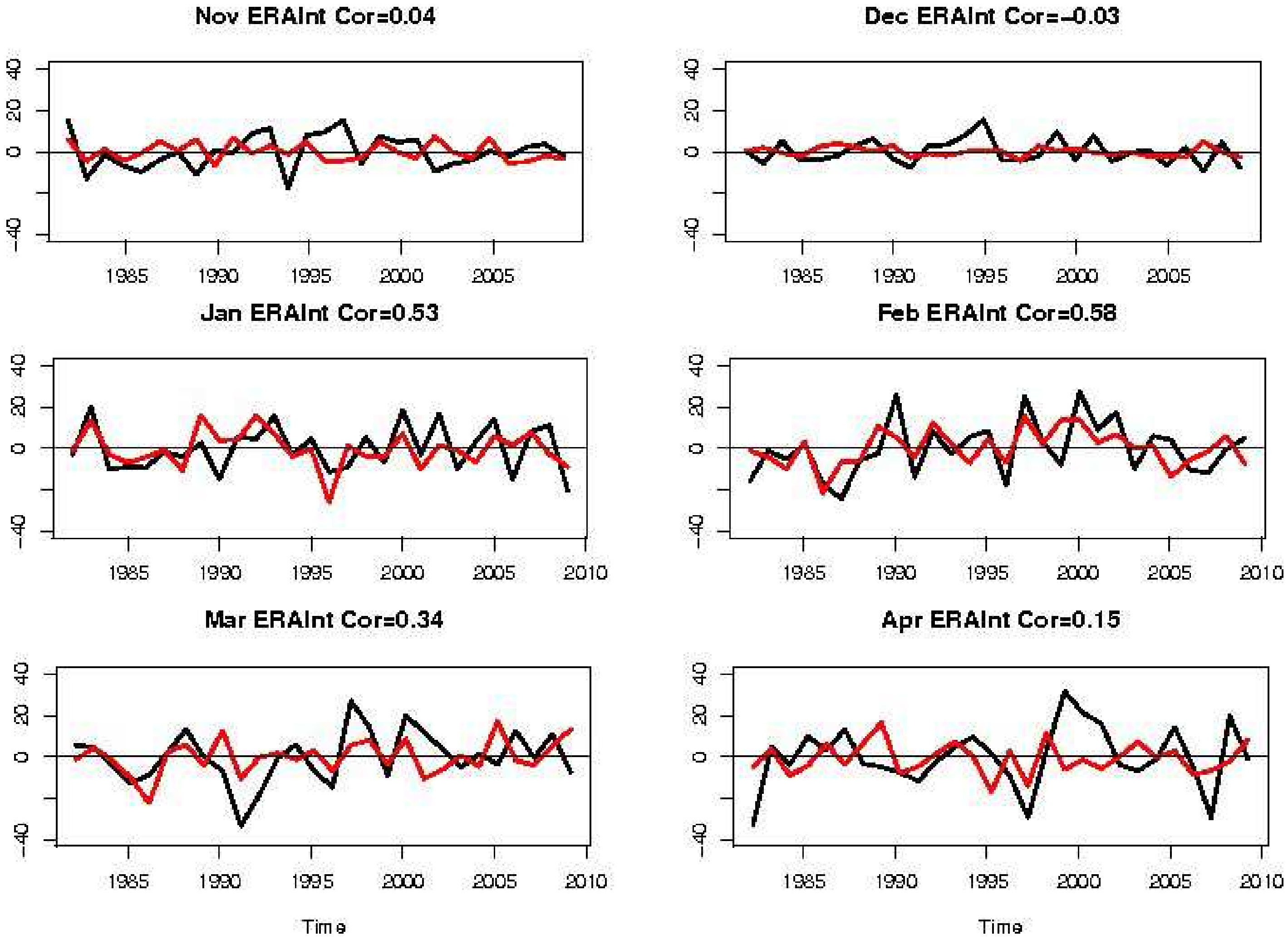
Downscaled downward solar radiation anomaly from ERAint in Northern Morocco using ERAint SLP as a predictor



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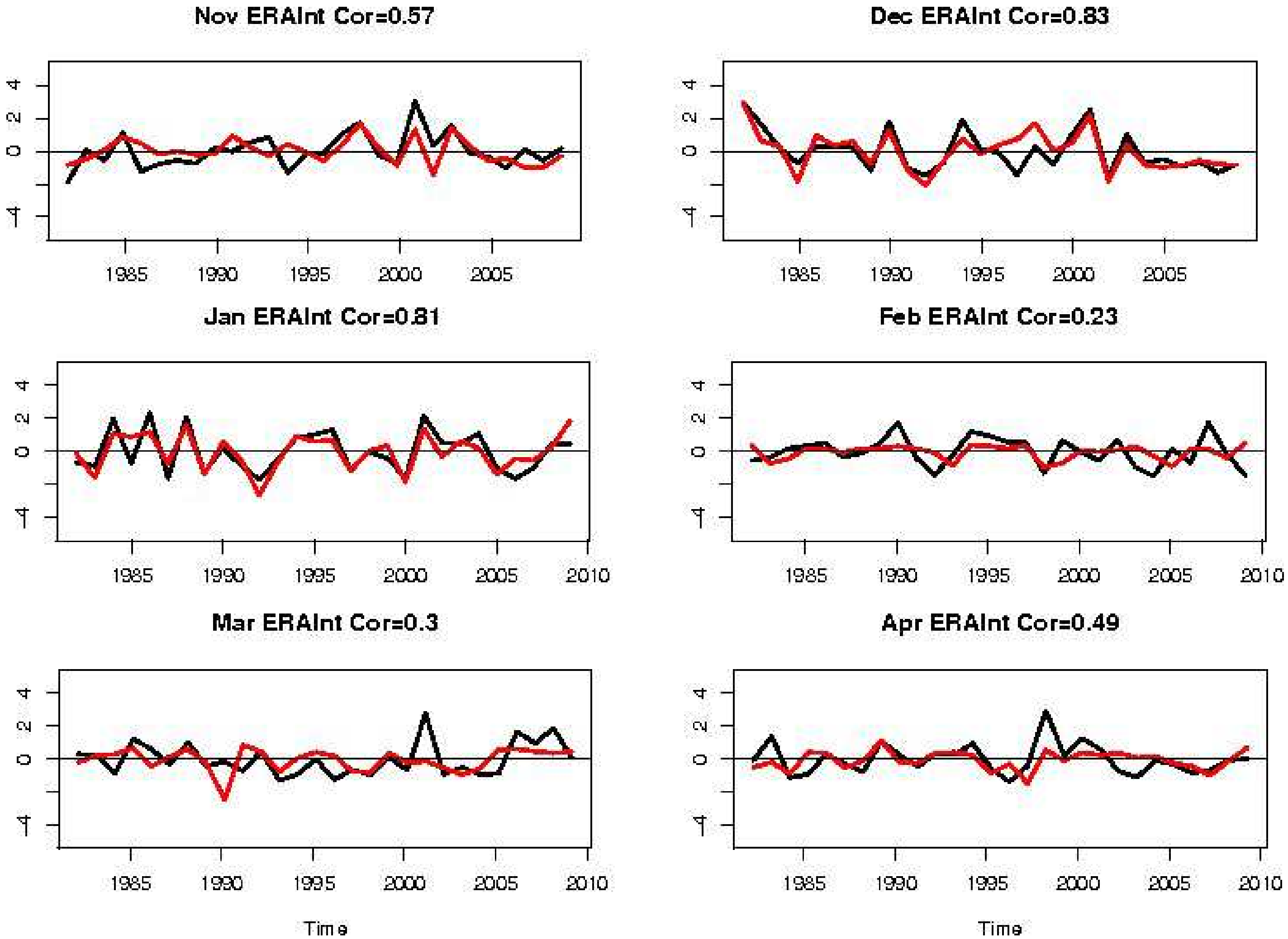
Downscaled wind speed anomaly (m/s) from ERAint in Northern Spain using ERAint SLP as a predictor



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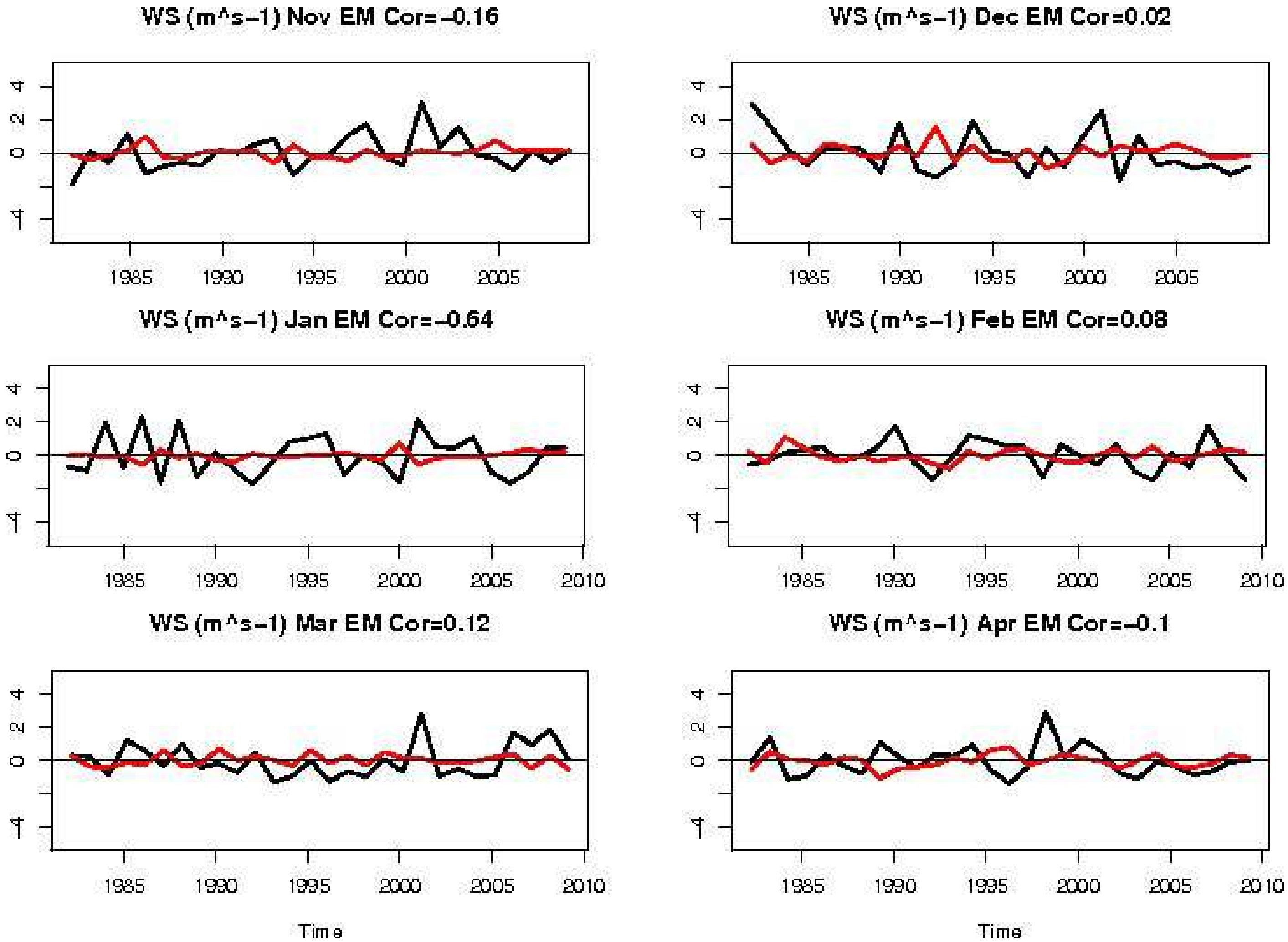
Downscaled wind speed anomaly (m/s) from ERAint in Northern Spain using ECMWF S4 as a predictor (start Nov.)



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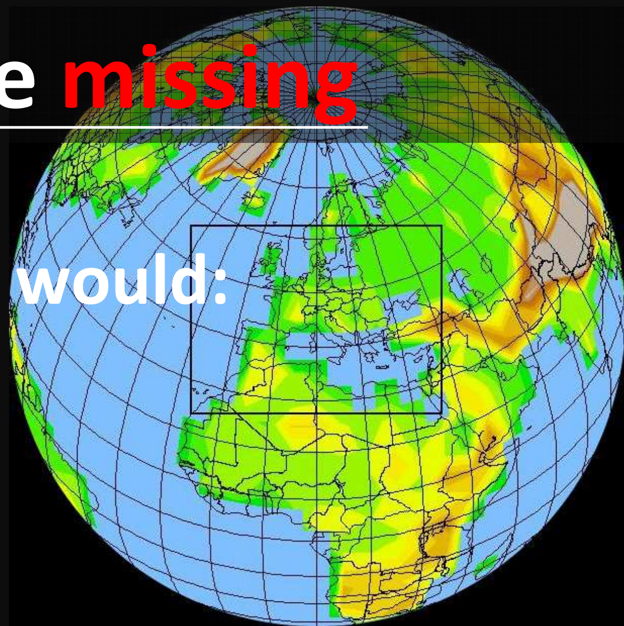
Conclusion

For the whole Renewable Energy sector, simple and reliable climate predictions are missing



Higher quality, complete climate data would:

- **accelerate market growth**
- **positive impact on decision making**
- **reduce uncertainty of financial investments**

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Thank You!

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